

CLAIMS

1 (I) In a vehicle having a right and left side and substantially massive components, and having at least one
2 fixed body member connected with substantial rigidity to substantially all of the substantially massive
3 components of said vehicle, a vehicle structure having an operating position attained during normal driving
4 conditions and an extended position attained at the time of passenger and operator access to the vehicle, said
5 vehicle structure having a means to divert the impact energy in lateral impacts to be absorbed by said vehicle
6 through the at least one fixed body member while releasing the passengers and operators each having mass,
7 weight, left and right sides, a back and a bottom, to move independently of said vehicle, in a passenger support
8 mechanism with a plurality of elements in a predetermined controlled fashion, in order to minimize injury to
9 such operators and passengers.

11 2.(D) The vehicle structure of claim 1, further comprising:

- 12 a) at least one pair of impact decoupler/secondary slides each with a first face and a second face, attached by
13 said first face to the at least one fixed body member on the left side and the right side of the vehicle
14 respectively, the members of each pair being mounted at the same longitudinal position of said vehicle;
- 15 b) a plurality of passenger support mechanisms each having ejecting elements and non-ejecting elements and
16 each of said passenger support mechanisms mounted in pairs on each of the left and the right sides of the
17 said vehicle on at least one lateral axes such that the pair having its members closest to the external surface
18 of the vehicle structure constitutes an outermost pair and such that the pair having its members closest to
19 the center of the vehicle structure constitutes an innermost pair;
- 20 c) at least one pair of a safety beam lower element each member of said pair fixedly connected to said non-
21 ejecting elements of the passenger support mechanisms, and each of said safety beam lower element
22 having a first face and a second face, and said second face attached to the second face of said impact
23 decoupler/secondary slides such that each of said safety beam lower element are normally fixedly
24 attached by said second face to the second face of a member of said pair of impact decoupler/secondary
25 slide, but become decoupled and thereafter slidably attached by said second face to said impact
26 decoupler/secondary slides along a lateral axis when a lateral shear force greater than a predetermined
27 force is applied to said first face relative to said second face of said impact decouplers/secondary slides
28 allowing said safety beam lower element attached to said second face of said impact decouplers/secondary
29 slides to slide along said lateral axis relative to said impact decouplers/secondary slides, said safety beam
30 lower element mounted on each of said impact decouplers/secondary slides being constructed such that
31 after they are decoupled, they can be guided laterally by, and are slidably attached to at least one member of
32 a pair of said impact decoupler/secondary slides and further positioned on the said impact
33 decouplers/secondary slides at all times such that they are not obstructed by any elements of the vehicle in
34 the event that said safety beam lower element need under collision conditions to traverse the center of the
35 vehicle to the further side of the vehicle;
- 36 d) at least one pair of an safety beam upper element each member of said pair having a first face and a
37 second face, and each of the members of said pair mounted with its first face to the first face of each
38 member of said pair of said safety beam lower element on the left and the right sides of the vehicle, and
39 fixedly attached by said second face to the ejecting elements of one of the passenger support mechanisms
- 40 e) at least one shock-absorbing device and at least one force distributing protector shield both installed to
41 protect each member of the outermost pair of passenger support mechanisms, on each of the left and right
42 sides of the vehicle, and locked to the fixed body members of the vehicle when in the operating position;
43 and
- 44 f) internal airbags, each mounted on the outer side of each of the outermost said passenger support
45 mechanisms, but inside said shock absorbers and protector shields, on both the left and the right sides of the
46 vehicle, such that upon detection of an impact event, the airbag deploys next to said passenger support
47 mechanism(s) and deploying upwards and inwards to protect the passengers.

48 3. The vehicle structure of claim 2, wherein said non-ejecting elements of said passenger support mechanisms
49 comprise the inner arm rest and other elements of the passenger support mechanism supporting the
50 passenger on the inner side of the vehicle and wherein said ejecting elements of said passenger support
51 mechanisms comprise the outer arm rest and other elements of the passenger support mechanism
52 supporting the passenger on the entry side of the vehicle.

- 1 4. The vehicle structure of claim 2, wherein said non-ejecting elements of said passenger support mechanisms
2 consist of a null set of elements and the ejecting elements of the passenger support mechanism consist of
3 all elements of the passenger support mechanisms.
- 4 5. (D) The vehicle structure of claim 2, wherein said internal airbags are preinflated to a predetermined
5 pressure.
- 6 6. (D) The internal airbags of claim 5, further comprising supplementary porous filling materials within said
7 internal airbags thereby changing the compression characteristics of said internal airbags under impact.
- 8 7. (I) A method of designing a passenger vehicle, comprising the sequence of:
9 a) designing a human environment that provides more than a minimal expected crash injury level, physical
10 comfort and utility;
11 b) designing a vehicle that hosts said human environment to meet vehicle performance characteristics,
12 thereby providing a "bottom up" design paradigm that targets human safety and utility as a priority.
- 13 8. (I) A method for impact protection of passengers in a vehicle by minimizing the intrusion of the impacting
14 body into the passenger space and minimizing the peak impact acceleration transferred to the said vehicle.
- 15 9. (D) The vehicle structure of claim 2, wherein said ejecting elements comprise one or more of the elements of
16 said passenger support mechanism that support the back, left side and right side of said passenger, said ejection
17 providing a means for passenger egress and ingress.
- 18 10. (D) The vehicle structure of claim 9, wherein said ejection comprises, a downward movement.
- 19 11. (D) The vehicle structure of claim 9, wherein said ejection comprises, a rearward movement.
- 20 12. (D) The vehicle structure of claim 2, wherein said ejecting elements comprise one or more elements
21 supporting the pelvis and upper legs of said passenger, said ejection providing a means for passenger egress and
22 ingress.
- 23 13. (D) The vehicle structure of claim 12, wherein said ejection comprises, an upward movement.
- 24 14. (D) The vehicle structure of claim 12, wherein said ejection comprises, a forward movement.
- 25 15. (D) The vehicle structure of claim 2, wherein said ejecting elements comprise all support elements for the
26 passenger, and wherein ejection raises the said ejected elements such that they can be subsequently be either
27 translated or rotated over the sill of the vehicle side to allow egress and ingress of said passenger.
- 28 16. (D) The vehicle structure of claim 1, further comprising:
29 g) at least one pair of impact decoupler/secondary slides each with a first face and a second face, attached by
30 said first face to the at least one fixed body member on the left side and the right side of the vehicle
31 respectively, the members of each pair being mounted at the same longitudinal position of said vehicle;
32 h) a plurality of passenger support mechanisms each having two interlocking parts consisting of an ejecting
33 element that may be displaced to facilitate egress and ingress, and non-ejecting element and each of said
34 passenger support mechanisms mounted in pairs on each of the left and the right sides of the said vehicle
35 on at least one lateral axes said non-ejecting element of each passenger support mechanism, having a
36 support face attached to the second face of said impact decoupler/secondary slides such that, each of said
37 non-ejecting elements of said passenger support mechanisms are normally fixedly attached by said support
38 face to the second face of a member of said pair of impact decoupler/secondary slide, but become
39 decoupled and thereafter slidably attached by said support face to said impact decoupler/secondary slides
40 along a lateral axis when a lateral shear force greater than a predetermined force is applied to said first face
41 relative to said second face of said impact decouplers/secondary slides allowing said non-ejecting elements
42 of said passenger support mechanism to detach from said impact decouplers/secondary slides and slide
43 along said lateral axis relative to said impact decouplers/secondary slides, said non-ejecting elements of the
44 passenger support mechanism mounted on each of said impact decouplers/secondary slides being
45 constructed such that after they are decoupled, they can be guided laterally by, and are slidably attached to
46 either member of a pair of said impact decoupler/secondary slides and further positioned on said impact
47 decouplers/secondary slides at all times such that they are not obstructed by any elements of the vehicle in
48 the event that said element of the passenger support mechanism need under collision conditions to traverse
49 the center of the vehicle to the further side of the vehicle, said two interlocking parts of said passenger
50 support mechanism being locked together while the vehicle is in operation and unlocked for egress and
51 ingress of the passenger;

- i) at least one shock-absorbing device and at least one force distributing protector shield both installed to protect each member of the pair of passenger support mechanisms, on each of the left and right sides of the vehicle, said force distributing protector shield being pivotally mounted to the fixed members of the vehicle and locked to the fixed body members of the vehicle when in the operating position; and
- j) preinflated internal airbags with a first face and a second face, the first face mounted on the outer side of each of the ejecting elements of the passenger support mechanism, and said second face attached to said shock absorbers and protector shields, on both the left and the right sides of the vehicle, such that upon detection of an impact event, the airbag deploys next to said passenger support mechanism(s) and deploying upwards and inwards to protect the passengers.

17.(I)) In a vehicle having a vehicle structure comprising a right and a left side an independantly ejectable mechanism for each of said passenger support mechanisms, wherein:

- a) said independently ejectable mechanisms for the passenger support mechanisms on the left side of the vehicle are mounted indirectly to fixed body members on the left side of said vehicle to allow said passenger support mechanisms on the left side of the vehicle to eject by one of: sliding along a lateral axis to a position substantially outside and adjoining the vehicle; rotating to face substantially outside the vehicle; extending to face substantially outside the vehicle and moving outwards from the vehicle, to a position substantially adjoining the vehicle on the left side thereby allowing said passengers that ride on said passenger support mechanisms on the left side of said vehicle to egress and ingress from the left side of the vehicle by ejecting said independently ejectable mechanisms; and
- b) said independently ejectable mechanisms for the passenger support mechanisms on the right side of the vehicle are mounted indirectly to fixed body members on the right side of said vehicle to allow said passenger support mechanisms on the right side of the vehicle to eject by one of: sliding along a lateral axis to a position substantially outside but adjoining the vehicle; rotating to face substantially outside the vehicle; extending to face substantially outside the vehicle and moving outwards from the vehicle, to a position substantially adjoining the vehicle on the right side thereby allowing said passengers that ride on said passenger support mechanisms on the right side of said vehicle to egress and ingress from the right side of the vehicle by ejecting said independently ejectable mechanisms.

18. (D) The vehicle structure of claim 17, wherein said passenger support mechanisms each further comprise a multi-element adjustable seat that provide a means for support to the body of said passenger and a removeable and lockable safety harness that is mounted with safety harness supports to said multi-element adjustable seat to deploy a surface that will protect and support predetermined parts of the human body when the vehicle sustains rapid changes in velocity, and wherein said safety harness supports are removable and lockable on at least one support point and pivotally supported on at least one support point to allow passenger to mount and dismount the said multi-element adjustable seat.

19.(D) The vehicle structure of claim 17, wherein said multi-element adjustable seat includes an adjustable section near the head and neck which supports said pivotally mounted safety harness supports, thereby allowing said safety harness to be released at the removable and lockable safety harness supports, to swing on said pivotally mounted safety harness supports, up and over the head of the passenger to allow the passenger access to said multi-element contoured seat.

20.(D) The vehicle structure as in claim 19, wherein said safety harness comprises:

- a) a pair of harness support arms that are pivotally attached to the passenger support mechanism in the vicinity of the head rest on either side, said harness support arms being spring mounted to raise the harness when removed for egress and ingress;
- b) telescoping sections with a first end and a second end, wherein said first end is attached to each of said harness support arms and with said second end attached to a protective shield that is designed to protect the head and neck under collision conditions;
- c) harness lower sections that are attached to the lower end of said protective shield and lock into the inner sides of the arm rests or the sides of said passenger support mechanisms;

thereby providing a support surface under frontal impact for the head neck and torso, and providing easy access for egress and ingress when released from the locks at the harness lower section.

21.(D) The vehicle structure of claim 17, wherein said multi-element adjustable seat supports said pivotally mounted safety harness, and wherein said safety harness comprises driving controls mounted on its front surface away from the passenger.

22.(D) The vehicle structure of claim 17, wherein said ejectable multi-element adjustable seat comprises arm rests with operational controls for driving said vehicle.

23.(I). In a vehicle with the region immediately below the windshield being substantially clear of instrumentation and controls, a computer controlled display system arranged to be immediately below said windshield to project information of interest to the driver, thereby providing an image that relates to the driving conditions as viewed by the driver in the windscreen.

24.(D) A computer controlled display system as in claim 23, wherein said display system projects at least one of position and velocity information with substantially the same orientation with regard to spacial position, direction and velocity from the perspective of the driver, with regard to what is seen by the driver in the windshield, thereby providing a mechanism for reference to said information with minimal physical motion of the head, and minimal mental processing for relative orientation of the display relative to the view in said windshield.

25.(I) A Passive Air Cushion System for protecting one or more protected entities, from impact from an impacting object comprising:

- a) an impacted structure in the vicinity of said protected entity;
- b) at least one sacrificial chamber located in a predetermined position within said impacted structure, such that said impact from impacting object, will compress said sacrificial chamber, said sacrificial chamber being filled with a compressible fluid;
- c) one or more fluid paths with flow control mechanisms, that are connected to said sacrificial chamber, and filled with said compressible fluid, such that under impact to the sacrificial chamber, said fluid paths may conduct a predetermined controlled volume of said compressible fluid out of said sacrificial chamber to predetermined locations;
- d) one or more micro-air cushions placed in locations in the vicinity of said protected entity and supported by said impacted structure, said micro-air cushions being connected to one or more of said fluid paths, thereby receiving predetermined controlled volumes of said compressible fluid from said fluid paths at and immediately following said impact;

thereby said sacrificial chamber inflating said micro-air cushions and protecting said protected entity.

26.(D). A Passive Air-cushion System as in claim 25, wherein said sacrificial chambers and Micro Air-cushions are constructed as adjoining micro chambers within an airbag, thereby providing visco-elastic impact energy absorption when said air bag is compressed only in selected location that compress some but not others of the micro chambers thereby inducing a transfer of air or other compressible fluid under controlling viscous forces from some of said micro chambers that act as sacrificial chambers to others of said micro chambers that act as micro-air cushions.

27.(D) A Passive Air-cushion System as in claim 26, wherein said micro-chambers are inflated prior to impact from a common source which is isolated by one way valves that close following inflation, thereby isolating the micro chambers of said Passive Air-cushion System

28.(D) A Passive Air-cushion System as in claim 25, wherein the protected entity is the head and neck of a passenger, the impacted object is a vehicle, and the impacting object impacts the vehicle from the rear of said vehicle, and wherein said sacrificial chamber is mounted in a position that will compress on impact by the impacting object, thereby said Passive air-cushion system protecting said passenger from whip-lash injury.

29.(D) A Passive Air-cushion System as in claim 28, wherein said sacrificial chamber is located behind seat support members and in front of support elements for the seat that are rigidly attached to the vehicle fixed members, and wherein said seat support members are rigidly attached to said support elements for the seat but detach from said support elements following a rear impact to said vehicle resulting from the acceleration of the inertial mass of the passenger and seat, and are thereafter slidably attached to said support elements, and thereby compress said sacrificial chamber.

30.(D) Two or more Passive Air-cushion Systems as in claim 25, consisting of a First set of Passive Air-cushion Systems and a Second Set of Passive Air-cushion systems, wherein the sacrificial chambers of said

- 1 Second Set of Passive Air-cushion systems are mounted adjacent to the Micro Air-cushions of said First Set of
- 2 Passive Air-cushion Systems, such that on inflation of the Micro Air-cushions of said First Set of Passive Air-
- 3 Cushion Systems, the sacrificial chambers of said Second Set of Passive-Air –Cushion systems are compressed,
- 4 thereby creating a cascaded system of Passive Air-cushion Systems to protect one or more protected entities in
- 5 the vicinity of said micro-air cushions of said Second set of Passive Air Cushion Systems.

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